User Provided Data Products from the "TNOs are Cool! – A Survey of the trans-Neptunian Region" Herschel Open Time Key Program

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Abstract

In this release note we describe the delivery of User Provided Data Products (UPDPs) of 133 targets, Centaurs and trans-Neptunian objects, observed with the PACS photometer cameras of the Herschel Space Observatory, taken in the framework of the 'TNOs are Cool! – A Survey of the trans-Neptunian region' Herschel Open Time Key Program. These UPDPs combined data of multiple epochs, were reduced with an optimized pipeline and applied corrections for an optimal background elimination.

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1 Introduction

This document describes the delivery of User Provided Data Products (UPDPs) of Centaurs and trans-Neptunian objects, observed with the PACS photometer cameras (Poglitsch et al., 2010) of the Herschel Space Observatory (Pilbratt et al., 2010) Observations in this delivery were taken in the framework of the 'TNOs are Cool! – A Survey of the trans-Neptunian region' Herschel Open Time Key Program (Müller et al., 2009)

UPDPs of this delivery contain combined observations of the targets observed at multiple epochs. These kind of data products are not produced by the Standard Product Generation pipeline of the Herschel Science Archive (HSA). As described below, we supply UPDPs for those targets only that scritily comply with the 'TNOs are Cool!' standard observing strategy and combined data product requirements. This is fulfilled for 132 Centaurs and trans-Neptunian objects, and in addition for one giant planet irregular moon, Sycorax, that was also part of the Open Time Key Program. Due to these requirements, this delivery is restricted to scan-map observations, data obtained in chop-nod mode are not presented. We apply a reduction pipeline optimized for faint, slow-moving targets, and use specific methods to correct for possible pointing and positional uncertainties, as described below.

Scientific results using these combined and optimized data products have already been published in a set of peer-reviewed papers (Duffard et al., 2014; Fornasier et al., 2013; Lellouch et al., 2010, 2013; Lim et al., 2014; Lacerda et al., 2014; Müller et al., 2010; Mommert et al., 2012; Santos-Sanz et al., 2012; Vilenius et al., 2012, 2014) The main aim of UPDPs in this present delivery is to provide the scientific community with the data products the previously published science results are based on. A detailed description of the processing steps and data products are given in Kiss et al. (2014).

2 Data reduction pipeline for scan map observations

We use a modified version of the PACS pipeline for basic data reduction of scan-maps, producing single images per OBSID, from raw data to Level-2 maps (for the definition of the Herschel/PACS data product levels, see the PACS Observer's Manual). Raw data were obtained from the Herschel Science Archive (SPG v14.2.0) and we used Herschel Interactive Processing Environment (HIPE, Ott 2010) version 14.1.0 (RC2) for the data reduction. We applied the following main parameters in HIPE (for a summary of the PACS photometer scan-maps calibration, see Balog et al., 2014):

- Raw data and auxiliary information are obtained directly from the HSA via the getObservation() task.
- Slews are selected on scan speed with a limit parameter of *limits=10*, i.e. between 15 and $25'' s^{-1}$ for $20'' s^{-1}$ scan speed. We note that only measurements with $20'' s^{-1}$ speed were considered for our UPDPs.
- High-pass filter width of 8, 9 and 16 readouts are used at 70, 100 and 160 μm, respectively – (high pass filter width sets the number of frames [2n+1] used for median subtraction from the detector timeline; see Popesso et al., 2012 and Balog et al., 2014, for a detailed description of the method).
- Masking pixels above 2-sigma, and at the source position with 2xFWHM radius
- We apply second level deglitching with nsigma=30, the sigma-clipping parameter of this deglitching method working on the map level (see the PACS Data Reduction Guide for more details).

Signal drift correction via the *scanamorphosBaselinePreprocessing()* task can be applied on the data in two ways, either using a fit algorithm (forceFitSubtraction=True) or simply masking the first frames of the observations. When the second option (forceMasking=True) is applied to typical scan map observations of faint targets, a significant part of the measurement is lost that results in a too low signal-to-noise ratio for the final maps. Therefore we do not use this option for scan map observations.

We apply the drizzle method to project the time-line data and produce the single maps using the *photProject()* task in HIPE, with a pixel fraction parameter of 1.0.

We use pixel sizes of 1.″1, 1.″4 and 2.″1 in the PACS 70, 100 and 160 μm bands, respectively, that allows an optimal sampling of the respective point spread functions. As our targets are Centaurs and trans-Neptunian objects their typical apparent speeds are low, and the displacements are usually negligible within a given observation section (see below). Therefore in our pipeline specific motion correction in *not* applied – this is also an important requirement for and optimal background elimination, an essential step in the detection of faint targets.

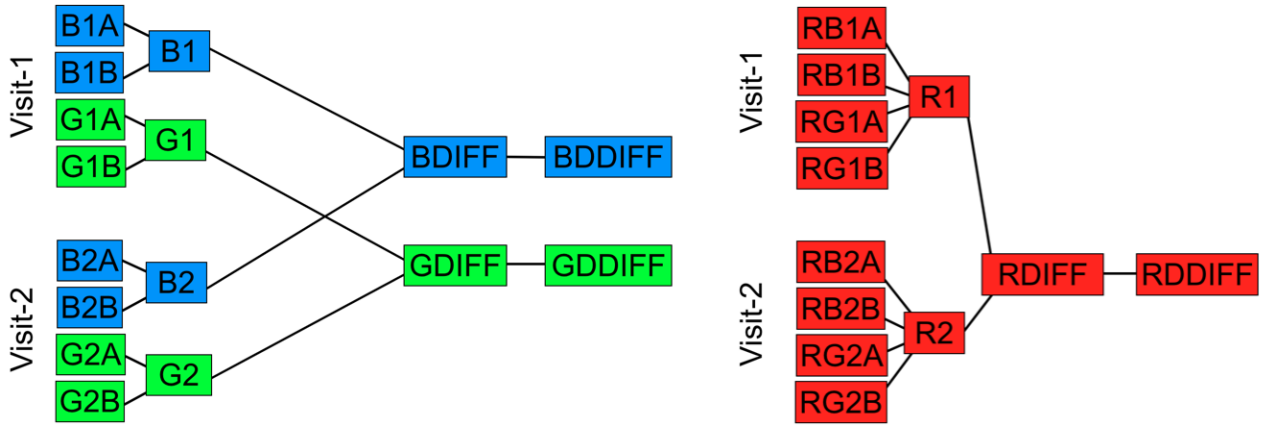

Figure 1: Outline of our standard observing and image derivation scheme for scan map observations of trans-Neptunian objects. The single maps (first column) are combined to obtain the co-added, single visit maps (second column), and these co-added maps are used to produce the different science data products (DIFF and DDIFF maps) that are used to obtain the final fluxes. The left and right panels of the figure show the scheme separately for the short wavelength (70/100 μm, or blue/green) and for the long wavelength (160 μm or red) PACS channels. In each box in the first letter marks the filter (B=blue, G=green, R=red), the second marks the epoch (1 = Visit-1, 2 = Visit-2), the third marks the scan direction (A = 70 deg, B = 110 deg). In the case of the red filter sequences the double letters (RB or RG) marks the corresponding short/long wavelength filter combination. The DIFF and DDIFF labels correspond to the differential and double-differential images, respectively.

3 Data products from "TNOs are Cool!" mini-scanmaps

3.1 General description

Data reduction of slow-moving targets (typical apparent speed of ∼1 arcsec/h) allows for an optimised background elimination in the case of properly designed observations, as described in detail in Kiss et

al. (2014). In a standard 'TNOs are Cool!' sequence the target was observed at two epochs, referred to as visit-1 and visit-2. The time between the two visits was set in a way that the target moved $\sim 30''$ with respect to the sky background that allowed us to use observations at the two epochs as mutual backgrounds. Observations at a specific visit also included scan/cross-scan observations in the same band, and usually observations in both possible PACS photometer filter combinations (70/160 and 100/160 μm).

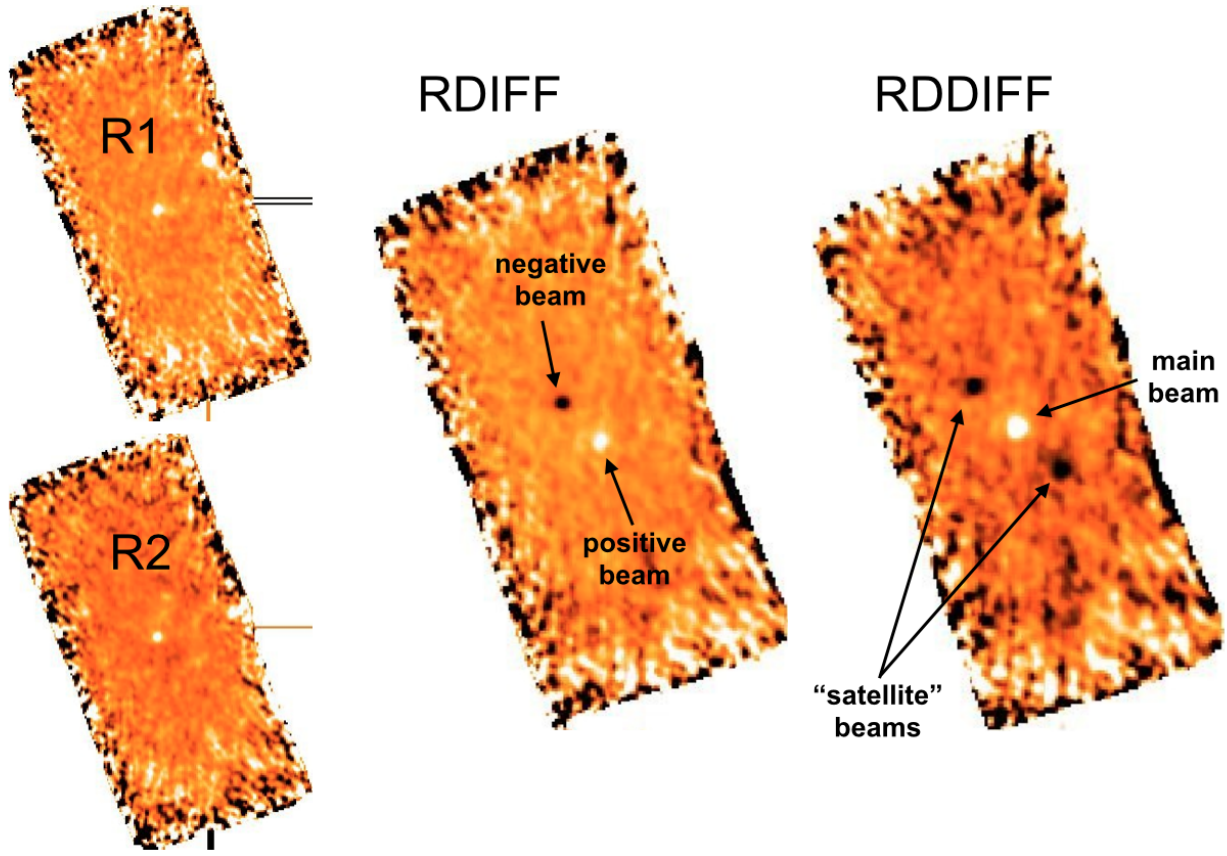

Figure 2: Demonstration of the data product sequence using the 160 μm measurements of the Centaur 10199 Chariklo. Using the co-added R1 and R2 images, produced from observations at two separate epochs (right), the differential image (middle, 'DIFF') is produced with one positive and one negative beam of the target. The DIFF image is further processed to obtain the double-differential (DDIFF) image, with a single main beam and two satellite beams.

As mentioned above, in the case of these observations we do not correct for the apparent motion of the target. In these cases, as a further step in our data reduction after the production of Level-2 maps, we combine the single maps obtained in visit-1 and visit-2 with the aim to reduce the effect of the confusion noise due to the sky background. We produce the following image products:

- Co-added images (from the Scan-A and Scan-B images of the same, single visit)
- Differential images (from the co-added images, DIFF). Optimal coordinate offsets are determined with the "background matching" method

- Double differential (DDIFF) images, created from the differential images, using "source matching" to determine the ideal offsets

The main outline of these data reduction steps are presented and illustrated in Kiss et al. (2014), here we just give a summary. All data processing steps after Level-2 maps are performed in IDL[1].

3.2 Co-added images:

Co-added images are generated using the maps of the individual OBSIDs in a specific band and in a single visit. In the case of both the blue and the green band we co-add two maps, the Scan-A and Scan-B images (B1 = B1A+B1B, G1 = G1A+G1B, etc., according to the scheme presented in Fig. 1). In the red band, all the four red maps (taken in parallel with blue/green and scan/cross-scan) are co-added (R1 = RB1A+RB1B+RG1A+RG1B, etc.). The co-added images are the bases of the further processing steps and data products.

3.3 Differential images and background matching:

Background matching is used to correct for the small offsets in the coordinate frames of the Visit-1 and Visit-2 images when obtaining the differential image, which is simply the difference of the combined Visit-1 and Visit-2 images in the respective bands (BDIFF = B1–B2, etc., see also Fig. 1). Incorrect offsets can easily be identified by the appearance of positive/negative spot pairs and in the increase of standard deviations in selected areas on the differential maps. The offset to be applied can be determined using images of systematically shifted coordinate frames and then determining the offset which provides the smallest standard deviation of the per-pixel flux distribution in a predefined coverage interval or image area (typically $0.3 <$ normalized coverage < 0.9). Our tests have proved that the same offset is obtained using any of the three PACS bands, however, in most cases the offset can be most readily determined using the 160 μm images, due to the strong sky background w.r.t. the instrument noise (see Kiss et al., 2014).

3.4 Double-differential images:

A double-differential (DDIFF) image is made of the DIFF image of a target at a specific wavelength. The disadvantage of the DIFF image is that the images of the target appears as two separated beams (one positive and one negative), corresponding to the two visits. To produce a DDIFF image, first the DIFF image is "folded" (multiplied by -1). The folded image is shifted in a way that the location of the two positive beams of the target match on the original and the folded image. Then, the original and the folded/shifted DIFF images are co-added:

$$DDIFF(\underline{x}) \; = \; DIFF(\underline{x}) - DIFF(\underline{x} + \underline{\theta}) \tag{1}$$

where the optimal offset $\underline{\theta}$ is determined with the source matching method (see below). The DDIFF image contains a positive beam with the *total flux* of the target and two negative beams at the sides with "half" of the total flux. This method has proved to provide the best performance in the detection of very faint sources (< 2 mJy at 70 μm), superior to the DIFF or 'supersky-subtracted' images (see Kiss et al., 2014).

[1] Interactive Data Language, ITT Visual Information Solutions

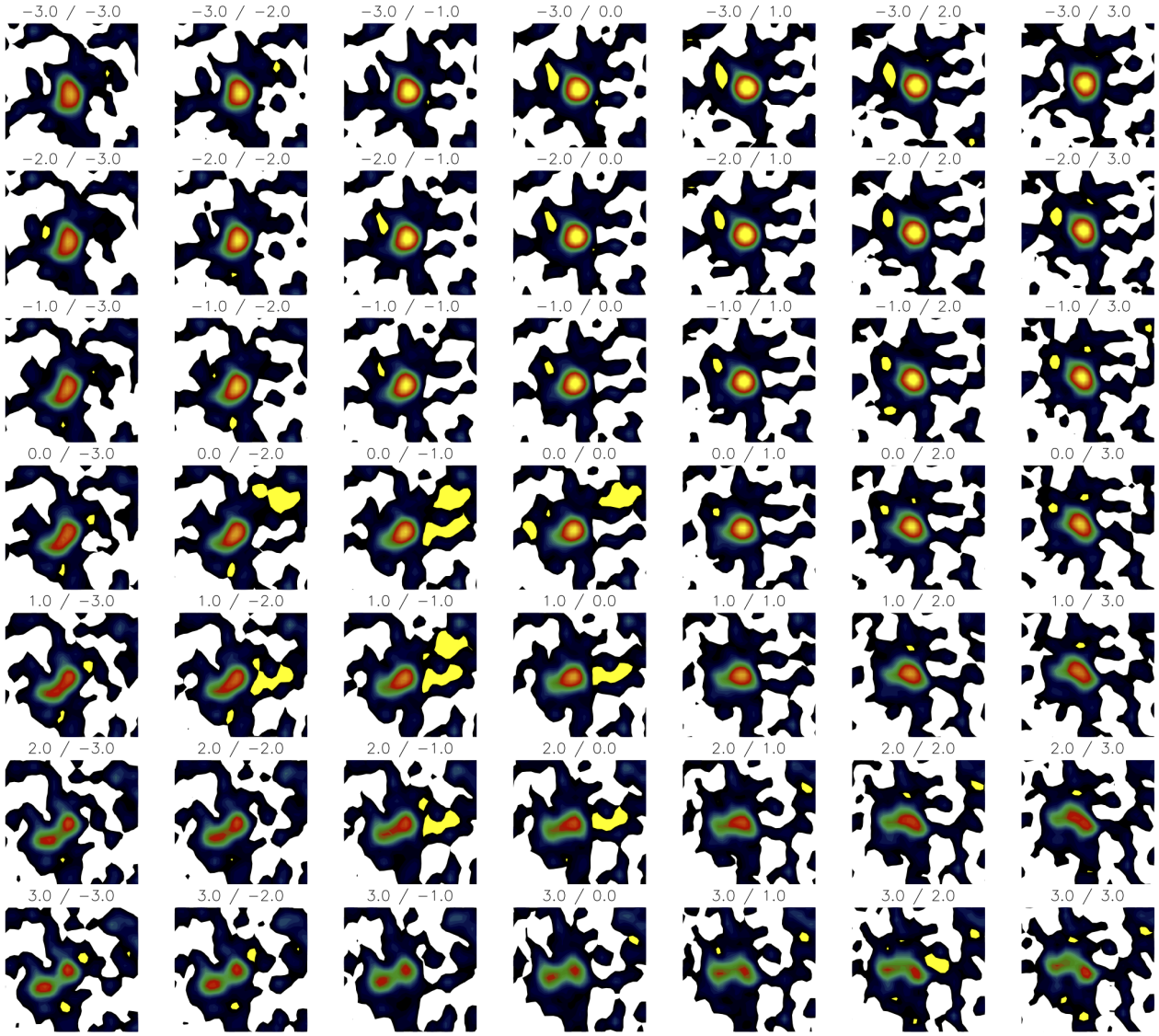

Figure 3: Source matching for Ixion (green band) to determine the optimal offset for the final DDIFF image. Wrong offsets can easily be identified by the distorted or double-peaked shape of the combined image. The numbers above the stamp figures correspond to the actual offsets in *arcsec* units (the optimal offsets are –2″.0 and +1″.0 in this case).

3.5 Source matching:

Background matching (see above) provided offsets for coordinate frame differences in the two visits, but positional differences may still remain due to e.g. not well known positions of the target, and wrong offsets lead to distorted shapes of the target image when the images of the two visits are combined to obtain double-differential images. "Source matching" determines the optimal offset ($\underline{\theta}$) that the original and folded DIFF images have to be shifted with to obtain the best matching of the centroids of the targets when we combine them to produce the DDIFF images. Typical offsets are a few arcseconds, we use the $\pm 4''$range both in R.A. and DEC to determine the offset. We demonstrate

the method in Fig. 3 for Ixion. For relatively bright targets (a few tens of mJy) the source matching correction typically increase the flux by $\lesssim 10$ per cent compared to the uncorrected case – in these cases the optimal offsets are in the order of $2''$. However, to detect very faint targets, source matching may be a necessary step to detect the target at all.

4 Data products provided as UPDPs

4.1 Description of the data products

Below we describe the data products that are provided in the current UPDP release. A specific product is identified by:

- the target name, which is a combination of the name, number, and/or provisional designation, e.g. "2060_Chiron" or "2004_NT33" (in the latter case the target only has a provisional designation).
- a data product flag that consists of a band flag ('B', 'G', or 'R' for the 70, 100 and 160 μm PACS bands, respectively) and a product type flag ('1', '2', 'DIFF' or 'DDIFF'), as detailed below (see also the respective FITS headers).

The following products are provided:

- Co-added images: As the data reduction steps in our pipeline are different from the standard HSA processing (e.g. lack of specific motion correction, different processing parameters) we provide the combined (co-added) images of each visits, using all measurements in that visit for a specific PACS band. This means a combination of two (scan and cross-scan) images for the 70 and 100 μm bands, and a combination of four images for the 160 μm bands. The co-added images are identified by the product flags 'B1', 'B2', 'G1', 'G2', 'R1' and 'R2', where 'B', 'G' and 'R' describe the band and '1' and '2' correspond to the first and second visits, respectively. As we perform no specific motion correction, the reference coordinate frame in the corresponding FITS files are correct for the background, and also for the target for the start of the measurements.
- Differential images (DIFF): A single differential image is provided for each target and for each band, which are correspondingly marked as 'BDIFF', 'GDIFF' and 'RDIFF'. The target appears as a pair of a positive and a negative beam, separated by a typical distance of $\sim 30''$. The expected position of the *positive beam* – based on the pointing information at the first visit – is stored in the FITS header in the keywords 'RA__EXP' and 'DEC_EXP', in equatorial coordinates (J2000). Note that this information should be used with care, as the target may be significantly (several arcseconds) off from its expected position. The DIFF images are "background-matched", the value of the offsets applied are stored in the FITS keywords 'SHBG__RA' and 'SHBG_DEC' (in R.A. and DEC, in arcsecond units). Although no background features are preserved here, the reference coordinate frame is indicative of the position of the target, with the positive beam being at the target position at the start of the Visit-1 measurement. The brightness of the two beams may intrinsically differ due to e.g. the different rotational phases at the two epochs.

- Double-differential images (DDIFF): A single differential image is provided for each target and for each band, which are correspondingly marked as 'BDDIFF', 'GDDIFF' and 'RDDIFF'. The target appears as a single positive beam accompanied with two negative satellite beams. The DDIFF images are "source-matched", the value of the offsets applied are store in the FITS keywords 'SHSM__RA' and 'SHSM_DEC' (in R.A. and DEC, in arcsecond units). Note that the DDIFF products combine data from two separate epochs and therefore provide a *mean* flux.

4.2 Quality issues

Herschel/PACS observations with solar aspect angles (SAA) of the spacecraft below -20° (Sanchez-Portal et al. 2014) may be pointing-critical. However, this does not occur to any of the measurements in this UPDP release. Also, on OD 1375 (February 17, 2013) half of the red PACS photometer array was lost. Later measurements have therefore lower coverage in the red channel, but with the standard processing and photometry remaining reliable. All observations in our list were executed before this date and are therefore unaffected. The bolometer detector bias re-setting (OD 132) and a fix in the detector setup procedure (OD 171) also happened before the first observations in the release.

Concerning specific objects, in the case of 52872 Okyrhoe the time/distance between the two visits were chosen in a way that the object falls at the edge of the mutual images, leaving too little overlap. This prevented us from creating the DDIFF images. While the DIFF images are provided, the target is likely too close to the map edge for reliable photometry. The co-added images of the individual visits are reliable, but indeed lack background elimination. In the case 143707 ($2003\,UZ_{117}$) only 70 μm measurements were executed, and therefore we provide co-added, differential and double-differential images for the 70 and 160 μm bands. The 160 μm co-added maps correspondingly contain data from two OBSIDs only, instead of the standard four.

4.3 Summary of additional FITS keywords

OBSID001, OBSID002, ... OBSIDnnn	Herschel observation identifiers (multiple observations)
PROPOSAL	Herschel proposal ID of the observations used
LAYER0, LAYER1	Type of data in a specific data layer of the FITS cube ("image" or "coverage")
EQLEVEL	Equivalent level of SPG processing
TARGET	Name or designation of the target
INSTRUME	Main Herschel instrument
SUBINSTR	Subinstrument
FILTER	Nominal wavelength of the filter used (mircometer)
DATAPRID	Type of data product
OBSJDSTA	start date (JD) of the first OBSID used
OBSJDEND	end date (JD) of the last OBSID used
SHBG__RA / SHBG_DEC	background matching offset in R.A. and DEC (arcsec)
SHSM__RA / SHSM_DEC	source matching offset in R.A. and DEC (arcsec)

Table 1: List of keywords added to the header of the data product FITS files. Note that not all keywords apply to a specific data product type.

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Appendix

Observations used for specific data products

Table 2: In this table we list all OBSIDs that were used for the generation of the differential 'DIFF' and 'DDIFF' end-products for the specific targets and PACS bands. The columns of the table are: (1) Name or identifier of the target; (2) band (nominal wavelength in μm); (3) list of OBSIDs; (4) start date of the first OBSID (Julian date); (5) end date of the last OBSID (Julian date). These information can also be found in the respective FITS file headers.

target	band	OBSIDs	JD(start)	JD(end)
10199 Chariklo	70	1342202372 1342202373 1342202570 1342202571	2455419.243	2455419.600
10199 Chariklo	100	1342202374 1342202375 1342202572 1342202573	2455419.251	2455419.608
10199 Chariklo	160	1342202372 1342202373 1342202374 1342202375	2455419.243	2455419.608
		1342202570 1342202571 1342202572 1342202573		
10370 Hylonome	70	1342215386 1342215387 1342215607 1342215608	2455627.489	2455628.521
10370 Hylonome	100	1342215388 1342215389 1342215609 1342215610	2455627.517	2455628.549
10370 Hylonome	160	1342215386 1342215387 1342215388 1342215389	2455627.489	2455628.549
		1342215607 1342215608 1342215609 1342215610		
119878 (2002 CY224)	70	1342195506 1342195507 1342195610 1342195611	2455311.490	2455313.494
119878 (2002 CY224)	100	1342195508 1342195509 1342195612 1342195613	2455311.511	2455313.515
119878 (2002 CY224)	160	1342195506 1342195507 1342195508 1342195509	2455311.490	2455313.515
		1342195610 1342195611 1342195612 1342195613		
119951 (2002 KX14)	70	1342205144 1342205145 1342205175 1342205176	2455466.390	2455467.149
119951 (2002 KX14)	100	1342205146 1342205147 1342205177 1342205178	2455466.411	2455467.170
119951 (2002 KX14)	160	1342205144 1342205145 1342205146 1342205147	2455466.390	2455467.170
		1342205175 1342205176 1342205177 1342205178		
119979 (2002 WC19)	70	1342204317 1342204318 1342204437 1342204438	2455450.326	2455453.088
119979 (2002 WC19)	100	1342204319 1342204320 1342204439 1342204440	2455450.347	2455453.109
119979 (2002 WC19)	160	1342204317 1342204318 1342204319 1342204320	2455450.326	2455453.109
		1342204437 1342204438 1342204439 1342204440		
120061 (2003 CO1)	70	1342202345 1342202346 1342202361 1342202362	2455418.251	2455418.808
120061 (2003 CO1)	100	1342202347 1342202348 1342202363 1342202364	2455418.266	2455418.823
120061 (2003 CO1)	160	1342202345 1342202346 1342202347 1342202348	2455418.251	2455418.823
		1342202361 1342202362 1342202363 1342202364		
120132 (2003 FY128)	70	1342212770 1342212771 1342213107 1342213108	2455578.271	2455580.710
120132 (2003 FY128)	100	1342212772 1342212773 1342213109 1342213110	2455578.292	2455580.731
120132 (2003 FY128)	160	1342212770 1342212771 1342212772 1342212773	2455578.271	2455580.731
		1342213107 1342213108 1342213109 1342213110		
120178 (2003 OP32)	70	1342197669 1342197670 1342197721 1342197722	2455350.569	2455352.124
120178 (2003 OP32)	100	1342197671 1342197672 1342197723 1342197724	2455350.584	2455352.139
120178 (2003 OP32)	160	1342197669 1342197670 1342197671 1342197672	2455350.569	2455352.139
		1342197721 1342197722 1342197723 1342197724		
120181 (2003 UR292)	70	1342199618 1342199619 1342199646 1342199647	2455379.388	2455380.029
120181 (2003 UR292)	100	1342199620 1342199621 1342199648 1342199649	2455379.409	2455380.050
120181 (2003 UR292)	160	1342199618 1342199619 1342199620 1342199621	2455379.388	2455380.050
		1342199646 1342199647 1342199648 1342199649		
120216 2004 EW95	70	1342199483 1342199484 1342199712 1342199713	2455378.295	2455380.584
120216 2004 EW95	100	1342199485 1342199486 1342199714 1342199715	2455378.317	2455380.605
120216 2004 EW95	160	1342199483 1342199484 1342199485 1342199486	2455378.295	2455380.605
		1342199712 1342199713 1342199714 1342199715		
120347 (2004 SB60) Salacia	70	1342198913 1342198914 1342199133 1342199134	2455369.539	2455370.289
120347 (2004 SB60) Salacia	100	1342198915 1342198916 1342199135 1342199136	2455369.553	2455370.304
120347 (2004 SB60) Salacia	160	1342198913 1342198914 1342198915 1342198916	2455369.539	2455370.304
		1342199133 1342199134 1342199135 1342199136		
120348 (2004 TY364)	70	1342202885 1342202886 1342202945 1342202946	2455420.414	2455421.373
120348 (2004 TY364)	100	1342202887 1342202888 1342202947 1342202948	2455420.435	2455421.394
120348 (2004 TY364)	160	1342202885 1342202886 1342202887 1342202888	2455420.414	2455421.394
		1342202945 1342202946 1342202947 1342202948		
126154 (2001 YH140)	70	1342206036 1342206037 1342206056 1342206057	2455477.322	2455478.101
126154 (2001 YH140)	100	1342206038 1342206039 1342206058 1342206059	2455477.343	2455478.122
126154 (2001 YH140)	160	1342206036 1342206037 1342206038 1342206039	2455477.322	2455478.122
		1342206056 1342206057 1342206058 1342206059		
127546 (2002 XU93)	70	1342204211 1342204212 1342204240 1342204241	2455449.101	2455449.387

127546 (2002 XU93)	100	1342204213 1342204214 1342204242 1342204243	2455449.122	2455449.409
127546 (2002 XU93)	160	1342204211 1342204212 1342204213 1342204214	2455449.101	2455449.409
		1342204240 1342204241 1342204242 1342204243		
133067 (2003 FB128)	70	1342237146 1342237147 1342237226 1342237227	2455938.169	2455938.853
133067 (2003 FB128)	100	1342237148 1342237149 1342237228 1342237229	2455938.197	2455938.881
133067 (2003 FB128)	160	1342237146 1342237147 1342237148 1342237149	2455938.169	2455938.881
		1342237226 1342237227 1342237228 1342237229		
134340 Pluto	70	1342191953 1342191954 1342191988 1342191989	2455265.742	2455266.306
134340 Pluto	100	1342191955 1342191956 1342191990 1342191991	2455265.756	2455266.321
134340 Pluto	160	1342191953 1342191954 1342191955 1342191956	2455265.742	2455266.321
		1342191988 1342191989 1342191990 1342191991		
135182 (2001 QT322)	70	1342222436 1342222437 1342222485 1342222486	2455722.720	2455723.509
135182 (2001 QT322)	100	1342222438 1342222439 1342222487 1342222488	2455722.760	2455723.550
135182 (2001 QT322)	160	1342222436 1342222437 1342222438 1342222439	2455722.720	2455723.550
		1342222485 1342222486 1342222487 1342222488		
135182 (2001 QT322)	70	1342222436 1342222437 1342222438 1342222439	2455722.720	2455723.550
135182 (2001 QT322)	100	1342222436 1342222437 1342222438 1342222439	2455722.720	2455723.550
135182 (2001 QT322)	160	1342222436 1342222437 1342222438 1342222439	2455722.720	2455723.550
		1342222485 1342222486 1342222487 1342222488		
136199 Eris	70	1342199487 1342199488 1342199753 1342199754	2455378.354	2455381.322
136199 Eris	100	1342199489 1342199490 1342199755 1342199756	2455378.376	2455381.343
136199 Eris	160	1342199487 1342199488 1342199489 1342199490	2455378.354	2455381.343
		1342199753 1342199754 1342199755 1342199756		
136204 (2003 WL7)	70	1342191941 1342191942 1342191966 1342191967	2455265.522	2455265.903
136204 (2003 WL7)	100	1342191943 1342191944 1342191968 1342191969	2455265.543	2455265.924
136204 (2003 WL7)	160	1342191941 1342191942 1342191943 1342191944	2455265.522	2455265.924
		1342191966 1342191967 1342191968 1342191969		
136472 Makemake	70	1342197657 1342197658 1342197695 1342197696	2455350.409	2455351.247
136472 Makemake	100	1342197659 1342197660 1342197697 1342197698	2455350.430	2455351.269
136472 Makemake	160	1342197657 1342197658 1342197659 1342197660	2455350.409	2455351.269
		1342197695 1342197696 1342197697 1342197698		
138537 (2000 OK67)	70	1342197665 1342197666 1342197717 1342197718	2455350.511	2455352.079
138537 (2000 OK67)	100	1342197667 1342197668 1342197719 1342197720	2455350.539	2455352.107
138537 (2000 OK67)	160	1342197665 1342197666 1342197667 1342197668	2455350.511	2455352.107
		1342197717 1342197718 1342197719 1342197720		
139775 (2001 QG298)	70	1342213211 1342213212 1342213266 1342213267	2455585.621	2455586.321
139775 (2001 QG298)	100	1342213213 1342213214 1342213268 1342213269	2455585.655	2455586.356
139775 (2001 QG298)	160	1342213211 1342213212 1342213213 1342213214	2455585.621	2455586.356
		1342213266 1342213267 1342213268 1342213269		
139775 (2001 QG298)	70	1342213211 1342213212 1342213213 1342213214	2455585.621	2455586.356
139775 (2001 QG298)	100	1342213211 1342213212 1342213213 1342213214	2455585.621	2455586.356
139775 (2001 QG298)	160	1342213211 1342213212 1342213213 1342213214	2455585.621	2455586.356
		1342213266 1342213267 1342213268 1342213269		
143707 (2003 UY117)	70	1342238745 1342238746 1342238790 1342238791	2455965.334	2455965.997
143707 (2003 UY117)	160	1342238745 1342238746 1342238790 1342238791	2455965.334	2455965.997
144897 (2004 UX10)	70	1342199495 1342199496 1342199626 1342199627	2455378.429	2455379.487
144897 (2004 UX10)	100	1342199497 1342199498 1342199628 1342199629	2455378.443	2455379.502
144897 (2004 UX10)	160	1342199495 1342199496 1342199497 1342199498	2455378.429	2455379.502
		1342199626 1342199627 1342199628 1342199629		
145451 (2005 RM43)	70	1342202281 1342202282 1342202320 1342202321	2455417.273	2455418.013
145451 (2005 RM43)	100	1342202283 1342202284 1342202322 1342202323	2455417.287	2455418.028
145451 (2005 RM43)	160	1342202281 1342202282 1342202283 1342202284	2455417.273	2455418.028
		1342202320 1342202321 1342202322 1342202323		
145452 (2005 RN43)	70	1342195583 1342195584 1342195600 1342195601	2455312.417	2455313.404
145452 (2005 RN43)	100	1342195585 1342195586 1342195602 1342195603	2455312.432	2455313.418
145452 (2005 RN43)	160	1342195583 1342195584 1342195585 1342195586	2455312.417	2455313.418
		1342195600 1342195601 1342195602 1342195603		
145453 (2005 RR43)	70	1342190957 1342190958 1342191033 1342191034	2455249.972	2455251.035
145453 (2005 RR43)	100	1342190959 1342190960 1342191035 1342191036	2455249.986	2455251.049
145453 (2005 RR43)	160	1342190957 1342190958 1342190959 1342190960	2455249.972	2455251.049
		1342191033 1342191034 1342191035 1342191036		
145480 (2005 TB190)	70	1342221729 1342221730 1342221782 1342221783	2455708.609	2455710.051
145480 (2005 TB190)	100	1342221731 1342221732 1342221784 1342221785	2455708.637	2455710.079
145480 (2005 TB190)	160	1342221729 1342221730 1342221731 1342221732	2455708.609	2455710.079
		1342221782 1342221783 1342221784 1342221785		

145486 (2005 UJ438)	70	1342218768 1342218769 1342218784 1342218785	2455669.533	2455669.820
145486 (2005 UJ438)	100	1342218770 1342218771 1342218786 1342218787	2455669.567	2455669.854
145486 (2005 UJ438)	160	1342218768 1342218769 1342218770 1342218771	2455669.533	2455669.854
		1342218784 1342218785 1342218786 1342218787		
148780 Altjira	70	1342190917 1342190918 1342191120 1342191121	2455249.454	2455251.562
148780 Altjira	100	1342190919 1342190920 1342191122 1342191123	2455249.481	2455251.589
148780 Altjira	160	1342190917 1342190918 1342190919 1342190920	2455249.454	2455251.589
		1342191120 1342191121 1342191122 1342191123		
15820 (1994 TB)	70	1342213518 1342213519 1342213569 1342213570	2455592.399	2455593.096
15820 (1994 TB)	100	1342213520 1342213521 1342213571 1342213572	2455592.433	2455593.130
15820 (1994 TB)	160	1342213518 1342213519 1342213520 1342213521	2455592.399	2455593.130
		1342213569 1342213570 1342213571 1342213572		
15874 (1996 TL66)	70	1342190953 1342190954 1342191029 1342191030	2455249.942	2455251.006
15874 (1996 TL66)	100	1342190955 1342190956 1342191031 1342191032	2455249.957	2455251.020
15874 (1996 TL66)	160	1342190953 1342190954 1342190955 1342190956	2455249.942	2455251.020
		1342191029 1342191030 1342191031 1342191032		
15875 (1996 TP66)	70	1342202289 1342202290 1342202310 1342202311	2455417.335	2455417.932
15875 (1996 TP66)	100	1342202291 1342202292 1342202312 1342202313	2455417.356	2455417.953
15875 (1996 TP66)	160	1342202289 1342202290 1342202291 1342202292	2455417.335	2455417.953
		1342202310 1342202311 1342202312 1342202313		
174567 (2003 MW12)	70	1342213822 1342213823 1342213932 1342213933	2455600.384	2455601.165
174567 (2003 MW12)	100	1342213824 1342213825 1342213934 1342213935	2455600.405	2455601.186
174567 (2003 MW12)	160	1342213822 1342213823 1342213824 1342213825	2455600.384	2455601.186
		1342213932 1342213933 1342213934 1342213935		
175113 (2004 PF115)	70	1342208462 1342208463 1342208841 1342208842	2455510.476	2455512.445
175113 (2004 PF115)	100	1342208464 1342208465 1342208843 1342208844	2455510.497	2455512.466
175113 (2004 PF115)	160	1342208462 1342208463 1342208464 1342208465	2455510.476	2455512.466
		1342208841 1342208842 1342208843 1342208844		
19308 (1996 TO66)	70	1342222430 1342222431 1342222481 1342222482	2455722.482	2455723.433
19308 (1996 TO66)	100	1342222432 1342222433 1342222483 1342222484	2455722.516	2455723.467
19308 (1996 TO66)	160	1342222430 1342222431 1342222432 1342222433	2455722.482	2455723.467
		1342222481 1342222482 1342222483 1342222484		
19521 Chaos	70	1342202285 1342202286 1342202316 1342202317	2455417.305	2455417.981
19521 Chaos	100	1342202287 1342202288 1342202318 1342202319	2455417.319	2455417.996
19521 Chaos	160	1342202285 1342202286 1342202287 1342202288	2455417.305	2455417.996
		1342202316 1342202317 1342202318 1342202319		
1999 CD158	70	1342206024 1342206025 1342206060 1342206061	2455477.238	2455478.151
1999 CD158	100	1342206026 1342206027 1342206062 1342206063	2455477.265	2455478.179
1999 CD158	160	1342206024 1342206025 1342206026 1342206027	2455477.238	2455478.179
		1342206060 1342206061 1342206062 1342206063		
20000 Varuna	70	1342205140 1342205141 1342205190 1342205191	2455466.343	2455467.330
20000 Varuna	100	1342205142 1342205143 1342205192 1342205193	2455466.358	2455467.344
20000 Varuna	160	1342205140 1342205141 1342205142 1342205143	2455466.343	2455467.344
		1342205190 1342205191 1342205192 1342205193		
2000 CN105	70	1342197691 1342197692 1342197781 1342197782	2455351.181	2455352.409
2000 CN105	100	1342197693 1342197694 1342197783 1342197784	2455351.203	2455352.430
2000 CN105	160	1342197691 1342197692 1342197693 1342197694	2455351.181	2455352.430
		1342197781 1342197782 1342197783 1342197784		
2001 KA77	70	1342205962 1342205963 1342206013 1342206014	2455476.354	2455477.105
2001 KA77	100	1342205964 1342205965 1342206015 1342206016	2455476.381	2455477.132
2001 KA77	160	1342205962 1342205963 1342205964 1342205965	2455476.354	2455477.132
		1342206013 1342206014 1342206015 1342206016		
2001 KD77	70	1342205966 1342205967 1342206009 1342206010	2455476.410	2455477.048
2001 KD77	100	1342205968 1342205969 1342206011 1342206012	2455476.438	2455477.076
2001 KD77	160	1342205966 1342205967 1342205968 1342205969	2455476.410	2455477.076
		1342206009 1342206010 1342206011 1342206012		
2001 QD298	70	1342211949 1342211950 1342212033 1342212034	2455546.148	2455546.951
2001 QD298	100	1342211951 1342211952 1342212035 1342212036	2455546.182	2455546.985
2001 QD298	160	1342211949 1342211950 1342211951 1342211952	2455546.148	2455546.985
		1342212033 1342212034 1342212035 1342212036		
2001 QF298	70	1342197661 1342197662 1342197681 1342197682	2455350.467	2455351.070
2001 QF298	100	1342197663 1342197664 1342197683 1342197684	2455350.488	2455351.092
2001 QF298	160	1342197661 1342197662 1342197663 1342197664	2455350.467	2455351.092
		1342197681 1342197682 1342197683 1342197684		

2001 QS322	70	1342212692 1342212693 1342212726 1342212727	2455576.999	2455577.874
2001 QS322	100	1342212694 1342212695 1342212728 1342212729	2455577.033	2455577.908
2001 QS322	160	1342212692 1342212693 1342212694 1342212695	2455576.999	2455577.908
		1342212726 1342212727 1342212728 1342212729		
2001 QX322	70	1342211619 1342211620 1342211807 1342211808	2455557.770	2455558.579
2001 QX322	100	1342211621 1342211622 1342211809 1342211810	2455557.804	2455558.613
2001 QX322	160	1342211619 1342211620 1342211621 1342211622	2455557.770	2455558.613
		1342211807 1342211808 1342211809 1342211810		
2001 QY297	70	1342209492 1342209493 1342209650 1342209651	2455518.887	2455520.367
2001 QY297	100	1342209494 1342209495 1342209652 1342209653	2455518.921	2455520.401
2001 QY297	160	1342209492 1342209493 1342209494 1342209495	2455518.887	2455520.401
		1342209650 1342209651 1342209652 1342209653		
2001 RZ143	70	1342199503 1342199504 1342199614 1342199615	2455378.502	2455379.352
2001 RZ143	100	1342199505 1342199506 1342199616 1342199617	2455378.536	2455379.386
2001 RZ143	160	1342199503 1342199504 1342199505 1342199506	2455378.502	2455379.386
		1342199614 1342199615 1342199616 1342199617		
2001 XR254	70	1342205184 1342205185 1342205264 1342205265	2455467.255	2455468.157
2001 XR254	100	1342205186 1342205187 1342205266 1342205267	2455467.283	2455468.185
2001 XR254	160	1342205184 1342205185 1342205186 1342205187	2455467.255	2455468.185
		1342205264 1342205265 1342205266 1342205267		
2002 GH32	70	1342212648 1342212649 1342212710 1342212711	2455576.449	2455577.480
2002 GH32	100	1342212650 1342212651 1342212712 1342212713	2455576.483	2455577.515
2002 GH32	160	1342212648 1342212649 1342212650 1342212651	2455576.449	2455577.515
		1342212710 1342212711 1342212712 1342212713		
2002 GP32	70	1342204144 1342204145 1342204204 1342204205	2455448.402	2455449.053
2002 GP32	100	1342204146 1342204147 1342204206 1342204207	2455448.423	2455449.075
2002 GP32	160	1342204144 1342204145 1342204146 1342204147	2455448.402	2455449.075
		1342204204 1342204205 1342204206 1342204207		
2002 GV31	70	1342198847 1342198848 1342198897 1342198898	2455368.317	2455369.412
2002 GV31	100	1342198849 1342198850 1342198899 1342198900	2455368.339	2455369.433
2002 GV31	160	1342198847 1342198848 1342198849 1342198850	2455368.317	2455369.433
		1342198897 1342198898 1342198899 1342198900		
2002 KW14	70	1342204196 1342204197 1342204282 1342204283	2455448.945	2455449.899
2002 KW14	100	1342204198 1342204199 1342204284 1342204285	2455448.966	2455449.921
2002 KW14	160	1342204196 1342204197 1342204198 1342204199	2455448.945	2455449.921
		1342204282 1342204283 1342204284 1342204285		
2002 MS4	70	1342204140 1342204141 1342204292 1342204293	2455448.369	2455450.126
2002 MS4	100	1342204142 1342204143 1342204294 1342204295	2455448.383	2455450.141
2002 MS4	160	1342204140 1342204141 1342204142 1342204143	2455448.369	2455450.141
		1342204292 1342204293 1342204294 1342204295		
2002 VU130	70	1342192762 1342192763 1342192783 1342192784	2455281.480	2455281.919
2002 VU130	100	1342192764 1342192765 1342192785 1342192786	2455281.501	2455281.940
2002 VU130	160	1342192762 1342192763 1342192764 1342192765	2455281.480	2455281.940
		1342192783 1342192784 1342192785 1342192786		
2002 XV93	70	1342193126 1342193127 1342193175 1342193176	2455287.066	2455287.795
2002 XV93	100	1342193128 1342193129 1342193177 1342193178	2455287.087	2455287.816
2002 XV93	160	1342193126 1342193127 1342193128 1342193129	2455287.066	2455287.816
		1342193175 1342193176 1342193177 1342193178		
2003 FE128	70	1342237150 1342237151 1342237230 1342237231	2455938.224	2455938.915
2003 FE128	100	1342237152 1342237153 1342237232 1342237233	2455938.259	2455938.949
2003 FE128	160	1342237150 1342237151 1342237152 1342237153	2455938.224	2455938.949
		1342237230 1342237231 1342237232 1342237233		
2003 GH55	70	1342212652 1342212653 1342212714 1342212715	2455576.518	2455577.549
2003 GH55	100	1342212654 1342212655 1342212716 1342212717	2455576.552	2455577.584
2003 GH55	160	1342212652 1342212653 1342212654 1342212655	2455576.518	2455577.584
		1342212714 1342212715 1342212716 1342212717		
2003 QA91	70	1342233581 1342233582 1342234252 1342234253	2455900.027	2455901.438
2003 QA91	100	1342233583 1342233584 1342234254 1342234255	2455900.067	2455901.479
2003 QA91	160	1342233581 1342233582 1342233583 1342233584	2455900.027	2455901.479
		1342234252 1342234253 1342234254 1342234255		
2003 QW90	70	1342213019 1342213020 1342213063 1342213064	2455580.952	2455580.044
2003 QW90	100	1342213021 1342213022 1342213065 1342213066	2455580.986	2455580.078
2003 QW90	160	1342213019 1342213020 1342213021 1342213022	2455580.952	2455580.078
		1342213063 1342213064 1342213065 1342213066		

2003 UT292	70	1342190949 1342190950 1342191025 1342191026	2455249.888	2455250.964
2003 UT292	100	1342190951 1342190952 1342191027 1342191028	2455249.915	2455250.991
2003 UT292	160	1342190949 1342190950 1342190951 1342190952	2455249.888	2455250.991
		1342191025 1342191026 1342191027 1342191028		
2003 UZ117	70	1342190961 1342190962 1342191037 1342191038	2455250.001	2455251.071
2003 UZ117	100	1342190963 1342190964 1342191039 1342191040	2455250.022	2455251.091
2003 UZ117	160	1342190961 1342190962 1342190963 1342190964	2455250.001	2455251.091
		1342191037 1342191038 1342191039 1342191040		
2003 UZ413	70	1342212760 1342212761 1342212858 1342212859	2455578.098	2455579.845
2003 UZ413	100	1342212762 1342212763 1342212860 1342212861	2455578.113	2455579.859
2003 UZ413	160	1342212760 1342212761 1342212762 1342212763	2455578.098	2455579.859
		1342212858 1342212859 1342212860 1342212861		
2003 WU172	70	1342250794 1342250795 1342250830 1342250831	2456180.528	2456181.356
2003 WU172	100	1342250796 1342250797 1342250832 1342250833	2456180.543	2456181.377
2003 WU172	160	1342250794 1342250795 1342250796 1342250797	2456180.528	2456181.377
		1342250830 1342250831 1342250832 1342250833		
2003 WU188	70	1342228922 1342228923 1342229040 1342229041	2455824.178	2455825.191
2003 WU188	100	1342228924 1342228925 1342229042 1342229043	2455824.219	2455825.231
2003 WU188	160	1342228922 1342228923 1342228924 1342228925	2455824.178	2455825.231
		1342229040 1342229041 1342229042 1342229043		
2004 NT33	70	1342219015 1342219016 1342219044 1342219045	2455670.554	2455671.053
2004 NT33	100	1342219017 1342219018 1342219046 1342219047	2455670.575	2455671.074
2004 NT33	160	1342219015 1342219016 1342219017 1342219018	2455670.554	2455671.074
		1342219044 1342219045 1342219046 1342219047		
2004 PG115	70	1342219009 1342219010 1342219048 1342219049	2455670.514	2455671.091
2004 PG115	100	1342219011 1342219012 1342219050 1342219051	2455670.529	2455671.106
2004 PG115	160	1342219009 1342219010 1342219011 1342219012	2455670.514	2455671.106
		1342219048 1342219049 1342219050 1342219051		
2004 PT107	70	1342195396 1342195397 1342195462 1342195463	2455309.532	2455310.447
2004 PT107	100	1342195398 1342195399 1342195464 1342195465	2455309.553	2455310.468
2004 PT107	160	1342195396 1342195397 1342195398 1342195399	2455309.532	2455310.468
		1342195462 1342195463 1342195464 1342195465		
2005 EF298	70	1342208962 1342208963 1342208999 1342209000	2455504.304	2455504.921
2005 EF298	100	1342208964 1342208965 1342209001 1342209002	2455504.338	2455504.955
2005 EF298	160	1342208962 1342208963 1342208964 1342208965	2455504.304	2455504.955
		1342208999 1342209000 1342209001 1342209002		
2005 QU182	70	1342212619 1342212620 1342212696 1342212697	2455576.100	2455577.083
2005 QU182	100	1342212621 1342212622 1342212698 1342212699	2455576.115	2455577.098
2005 QU182	160	1342212619 1342212620 1342212621 1342212622	2455576.100	2455577.098
		1342212696 1342212697 1342212698 1342212699		
2005 RO43	70	1342212848 1342212849 1342213115 1342213116	2455579.767	2455580.803
2005 RO43	100	1342212850 1342212851 1342213117 1342213118	2455579.788	2455580.824
2005 RO43	160	1342212848 1342212849 1342212850 1342212851	2455579.767	2455580.824
		1342213115 1342213116 1342213117 1342213118		
2005 RS43	70	1342213502 1342213503 1342213558 1342213559	2455592.216	2455593.003
2005 RS43	100	1342213504 1342213505 1342213560 1342213561	2455592.244	2455593.030
2005 RS43	160	1342213502 1342213503 1342213504 1342213505	2455592.216	2455593.030
		1342213558 1342213559 1342213560 1342213561		
2006 HJ123	70	1342204150 1342204151 1342204200 1342204201	2455448.458	2455449.009
2006 HJ123	100	1342204152 1342204153 1342204202 1342204203	2455448.479	2455449.030
2006 HJ123	160	1342204150 1342204151 1342204152 1342204153	2455448.458	2455449.030
		1342204200 1342204201 1342204202 1342204203		
2006 SX368	70	1342188416 1342188417 1342196759 1342196760	2455187.277	2455337.050
2006 SX368	100	1342196761 1342196762 1342196773 1342196774	2455337.051	2455337.285
2006 SX368	160	1342188416 1342188417 1342196759 1342196760	2455187.277	2455337.264
		1342196761 1342196762 1342196771 1342196772		
2007 OC10	70	1342206671 1342206672 1342206698 1342206699	2455486.390	2455487.991
2007 OC10	100	1342206673 1342206674 1342206700 1342206701	2455486.411	2455488.012
2007 OC10	160	1342206671 1342206672 1342206673 1342206674	2455486.390	2455488.012
		1342206698 1342206699 1342206700 1342206701		
2007 RW10	70	1342213219 1342213220 1342213270 1342213271	2455585.717	2455586.377
2007 RW10	100	1342213221 1342213222 1342213272 1342213273	2455585.738	2455586.398
2007 RW10	160	1342213219 1342213220 1342213221 1342213222	2455585.717	2455586.398
		1342213270 1342213271 1342213272 1342213273		

2008 FC76	70	1342222926 1342222927 1342222933 1342222934	2455734.842	2455735.066
2008 FC76	100	1342222928 1342222929 1342222935 1342222936	2455734.856	2455735.080
2008 FC76	160	1342222926 1342222927 1342222928 1342222929	2455734.842	2455735.080
		1342222933 1342222934 1342222935 1342222936		
2010 EK139	70	1342211418 1342211419 1342211524 1342211525	2455553.794	2455554.345
2010 EK139	100	1342211420 1342211421 1342211526 1342211527	2455553.809	2455554.360
2010 EK139	160	1342211418 1342211419 1342211420 1342211421	2455553.794	2455554.360
		1342211524 1342211525 1342211526 1342211527		
202421 (2005 UQ513)	70	1342212680 1342212681 1342212722 1342212723	2455576.865	2455577.815
202421 (2005 UQ513)	100	1342212682 1342212683 1342212724 1342212725	2455576.887	2455577.836
202421 (2005 UQ513)	160	1342212680 1342212681 1342212682 1342212683	2455576.865	2455577.836
		1342212722 1342212723 1342212724 1342212725		
2060 Chiron	70	1342195392 1342195393 1342195404 1342195405	2455309.501	2455309.809
2060 Chiron	100	1342195394 1342195395 1342195406 1342195407	2455309.516	2455309.823
2060 Chiron	160	1342195392 1342195393 1342195394 1342195395	2455309.501	2455309.823
		1342195404 1342195405 1342195406 1342195407		
2060 Chiron	70	1342195392 1342195393 1342195394 1342195395	2455309.501	2455309.823
2060 Chiron	100	1342195392 1342195393 1342195394 1342195395	2455309.501	2455309.823
2060 Chiron	160	1342195392 1342195393 1342195394 1342195395	2455309.501	2455309.823
		1342195404 1342195405 1342195406 1342195407		
225088 (2007 OR10)	70	1342220081 1342220082 1342220272 1342220273	2455688.567	2455691.498
225088 (2007 OR10)	100	1342220083 1342220084 1342220274 1342220275	2455688.594	2455691.526
225088 (2007 OR10)	160	1342220081 1342220082 1342220083 1342220084	2455688.567	2455691.526
		1342220272 1342220273 1342220274 1342220275		
229762 (2007 UK126)	70	1342202277 1342202278 1342202324 1342202325	2455417.242	2455418.044
229762 (2007 UK126)	100	1342202279 1342202280 1342202326 1342202327	2455417.256	2455418.059
229762 (2007 UK126)	160	1342202277 1342202278 1342202279 1342202280	2455417.242	2455418.059
		1342202324 1342202325 1342202326 1342202327		
230965 (2004 XA192)	70	1342217343 1342217344 1342217399 1342217400	2455649.633	2455650.234
230965 (2004 XA192)	100	1342217345 1342217346 1342217401 1342217402	2455649.647	2455650.249
230965 (2004 XA192)	160	1342217343 1342217344 1342217345 1342217346	2455649.633	2455650.249
		1342217399 1342217400 1342217401 1342217402		
24835 (1995 SM55)	70	1342190925 1342190926 1342190994 1342190995	2455249.539	2455250.442
24835 (1995 SM55)	100	1342190927 1342190928 1342190996 1342190997	2455249.553	2455250.457
24835 (1995 SM55)	160	1342190925 1342190926 1342190927 1342190928	2455249.539	2455250.457
		1342190994 1342190995 1342190996 1342190997		
250112 (2002 KY14)	70	1342211112 1342211113 1342211144 1342211145	2455544.171	2455544.444
250112 (2002 KY14)	100	1342211114 1342211115 1342211146 1342211147	2455544.192	2455544.465
250112 (2002 KY14)	160	1342211112 1342211113 1342211114 1342211115	2455544.171	2455544.465
		1342211144 1342211145 1342211146 1342211147		
26181 (1996 GQ21)	70	1342212818 1342212819 1342213075 1342213076	2455579.393	2455580.229
26181 (1996 GQ21)	100	1342212820 1342212821 1342213077 1342213078	2455579.427	2455580.263
26181 (1996 GQ21)	160	1342212818 1342212819 1342212820 1342212821	2455579.393	2455580.263
		1342213075 1342213076 1342213077 1342213078		
26308 (1998 SM165)	70	1342199499 1342199500 1342199622 1342199623	2455378.458	2455379.451
26308 (1998 SM165)	100	1342199501 1342199502 1342199624 1342199625	2455378.480	2455379.472
26308 (1998 SM165)	160	1342199499 1342199500 1342199501 1342199502	2455378.458	2455379.472
		1342199622 1342199623 1342199624 1342199625		
26375 (1999 DE9)	70	1342223635 1342223636 1342223670 1342223671	2455746.208	2455747.081
26375 (1999 DE9)	100	1342223637 1342223638 1342223672 1342223673	2455746.223	2455747.095
26375 (1999 DE9)	160	1342223635 1342223636 1342223637 1342223638	2455746.208	2455747.095
		1342223670 1342223671 1342223672 1342223673		
28978 Ixion	70	1342227033 1342227034 1342227152 1342227153	2455795.098	2455797.886
28978 Ixion	100	1342227035 1342227036 1342227154 1342227155	2455795.113	2455797.900
28978 Ixion	160	1342227033 1342227034 1342227035 1342227036	2455795.098	2455797.900
		1342227152 1342227153 1342227154 1342227155		
32532 Thereus	70	1342216137 1342216138 1342216149 1342216150	2455626.616	2455626.937
32532 Thereus	100	1342216139 1342216140 1342216151 1342216152	2455626.631	2455626.952
32532 Thereus	160	1342216137 1342216138 1342216139 1342216140	2455626.616	2455626.952
		1342216149 1342216150 1342216151 1342216152		
33340 (1998 VG44)	70	1342216446 1342216447 1342216559 1342216560	2455641.218	2455642.415
33340 (1998 VG44)	100	1342216448 1342216449 1342216561 1342216562	2455641.239	2455642.436
33340 (1998 VG44)	160	1342216446 1342216447 1342216448 1342216449	2455641.218	2455642.436
		1342216559 1342216560 1342216561 1342216562		

35671 (1998 SN165)	70	1342212615 1342212616 1342212688 1342212689	2455576.056	2455576.975
35671 (1998 SN165)	100	1342212617 1342212618 1342212690 1342212691	2455576.077	2455576.996
35671 (1998 SN165)	160	1342212615 1342212616 1342212617 1342212618	2455576.056	2455576.996
		1342212688 1342212689 1342212690 1342212691		
38628 Huya	70	1342202873 1342202874 1342202914 1342202915	2455420.292	2455420.995
38628 Huya	100	1342202875 1342202876 1342202916 1342202917	2455420.307	2455421.009
38628 Huya	160	1342202873 1342202874 1342202875 1342202876	2455420.292	2455421.009
		1342202914 1342202915 1342202916 1342202917		
40314 (1999 KR16)	70	1342212814 1342212815 1342213071 1342213072	2455579.324	2455580.159
40314 (1999 KR16)	100	1342212816 1342212817 1342213073 1342213074	2455579.358	2455580.194
40314 (1999 KR16)	160	1342212814 1342212815 1342212816 1342212817	2455579.324	2455580.194
		1342213071 1342213072 1342213073 1342213074		
42301 (2001 UR163)	70	1342199507 1342199508 1342199650 1342199651	2455378.571	2455380.065
42301 (2001 UR163)	100	1342199509 1342199510 1342199652 1342199653	2455378.586	2455380.080
42301 (2001 UR163)	160	1342199507 1342199508 1342199509 1342199510	2455378.571	2455380.080
		1342199650 1342199651 1342199652 1342199653		
42355 Typhon	70	1342210596 1342210597 1342210624 1342210625	2455531.363	2455531.658
42355 Typhon	100	1342210598 1342210599 1342210626 1342210627	2455531.384	2455531.680
42355 Typhon	160	1342210596 1342210597 1342210598 1342210599	2455531.363	2455531.680
		1342210624 1342210625 1342210626 1342210627		
44594 (1999 OX3)	70	1342220559 1342220560 1342220578 1342220579	2455685.478	2455685.914
44594 (1999 OX3)	100	1342220561 1342220562 1342220580 1342220581	2455685.512	2455685.948
44594 (1999 OX3)	160	1342220559 1342220560 1342220561 1342220562	2455685.478	2455685.948
		1342220578 1342220579 1342220580 1342220581		
47171 (1999 TC36)	70	1342199491 1342199492 1342199630 1342199631	2455378.398	2455379.518
47171 (1999 TC36)	100	1342199493 1342199494 1342199632 1342199633	2455378.412	2455379.533
47171 (1999 TC36)	160	1342199491 1342199492 1342199493 1342199494	2455378.398	2455379.533
		1342199630 1342199631 1342199632 1342199633		
47932 (2000 GN171)	70	1342202906 1342202907 1342202971 1342202972	2455420.880	2455421.619
47932 (2000 GN171)	100	1342202908 1342202909 1342202973 1342202974	2455420.907	2455421.647
47932 (2000 GN171)	160	1342202906 1342202907 1342202908 1342202909	2455420.880	2455421.647
		1342202971 1342202972 1342202973 1342202974		
48639 (1995 TL8)	70	1342214043 1342214044 1342214165 1342214166	2455603.057	2455604.609
48639 (1995 TL8)	100	1342214045 1342214046 1342214167 1342214168	2455603.084	2455604.637
48639 (1995 TL8)	160	1342214043 1342214044 1342214045 1342214046	2455603.057	2455604.637
		1342214165 1342214166 1342214167 1342214168		
50000 Quaoar	70	1342205970 1342205971 1342206017 1342206018	2455476.467	2455477.148
50000 Quaoar	100	1342205972 1342205973 1342206019 1342206020	2455476.482	2455477.163
50000 Quaoar	160	1342205970 1342205971 1342205972 1342205973	2455476.467	2455477.163
		1342206017 1342206018 1342206019 1342206020		
5145 Pholus	70	1342205148 1342205149 1342205153 1342205154	2455466.435	2455466.843
5145 Pholus	100	1342205150 1342205151 1342205155 1342205156	2455466.456	2455466.864
5145 Pholus	160	1342205148 1342205149 1342205150 1342205151	2455466.435	2455466.864
		1342205153 1342205154 1342205155 1342205156		
52872 Okyrhoe	70	1342202865 1342202866 1342202893 1342202894	2455420.228	2455420.515
52872 Okyrhoe	100	1342202867 1342202868 1342202895 1342202896	2455420.242	2455420.529
52872 Okyrhoe	160	1342202865 1342202866 1342202867 1342202868	2455420.228	2455420.529
		1342202893 1342202894 1342202895 1342202896		
54598 Bienor	70	1342213252 1342213253 1342213274 1342213275	2455586.036	2455586.415
54598 Bienor	100	1342213254 1342213255 1342213276 1342213277	2455586.050	2455586.430
54598 Bienor	160	1342213252 1342213253 1342213254 1342213255	2455586.036	2455586.430
		1342213274 1342213275 1342213276 1342213277		
55565 (2002 AW197)	70	1342209471 1342209472 1342209654 1342209655	2455518.703	2455520.439
55565 (2002 AW197)	100	1342209473 1342209474 1342209656 1342209657	2455518.724	2455520.460
55565 (2002 AW197)	160	1342209471 1342209472 1342209473 1342209474	2455518.703	2455520.460
		1342209654 1342209655 1342209656 1342209657		
55576 Amycus	70	1342202341 1342202342 1342202367 1342202368	2455418.206	2455418.859
55576 Amycus	100	1342202343 1342202344 1342202369 1342202370	2455418.227	2455418.880
55576 Amycus	160	1342202341 1342202342 1342202343 1342202344	2455418.206	2455418.880
		1342202367 1342202368 1342202369 1342202370		
55636 (2002 TX300)	70	1342212764 1342212765 1342212802 1342212803	2455578.132	2455579.147
55636 (2002 TX300)	100	1342212766 1342212767 1342212804 1342212805	2455578.166	2455579.182
55636 (2002 TX300)	160	1342212764 1342212765 1342212766 1342212767	2455578.132	2455579.182
		1342212802 1342212803 1342212804 1342212805		

55637 (2002 UX25)	70	1342202881 1342202882 1342203035 1342203036	2455420.382	2455422.582
55637 (2002 UX25)	100	1342202883 1342202884 1342203037 1342203038	2455420.396	2455422.597
55637 (2002 UX25)	160	1342202881 1342202882 1342202883 1342202884	2455420.382	2455422.597
		1342203035 1342203036 1342203037 1342203038		
55638 (2002 VE95)	70	1342202901 1342202902 1342202953 1342202954	2455420.818	2455421.437
55638 (2002 VE95)	100	1342202903 1342202904 1342202955 1342202956	2455420.839	2455421.459
55638 (2002 VE95)	160	1342202901 1342202902 1342202903 1342202904	2455420.818	2455421.459
		1342202953 1342202954 1342202955 1342202956		
60558 Echeclus	70	1342201153 1342201154 1342201194 1342201195	2455401.242	2455403.063
60558 Echeclus	100	1342201155 1342201156 1342201196 1342201197	2455401.256	2455403.078
60558 Echeclus	160	1342201153 1342201154 1342201155 1342201156	2455401.242	2455403.078
		1342201194 1342201195 1342201196 1342201197		
65489 Ceto	70	1342202877 1342202878 1342202910 1342202911	2455420.323	2455420.958
65489 Ceto	100	1342202879 1342202880 1342202912 1342202913	2455420.344	2455420.979
65489 Ceto	160	1342202877 1342202878 1342202879 1342202880	2455420.323	2455420.979
		1342202910 1342202911 1342202912 1342202913		
66652 Borasisi	70	1342221733 1342221734 1342221806 1342221807	2455708.665	2455710.239
66652 Borasisi	100	1342221735 1342221736 1342221808 1342221809	2455708.706	2455710.279
66652 Borasisi	160	1342221733 1342221734 1342221735 1342221736	2455708.665	2455710.279
		1342221806 1342221807 1342221808 1342221809		
73480 (2002 PN34)	70	1342213067 1342213068 1342213089 1342213090	2455580.081	2455580.395
73480 (2002 PN34)	100	1342213069 1342213070 1342213091 1342213092	2455580.096	2455580.410
73480 (2002 PN34)	160	1342213067 1342213068 1342213069 1342213070	2455580.081	2455580.410
		1342213089 1342213090 1342213091 1342213092		
78799 (2002 XW93)	70	1342190913 1342190914 1342191116 1342191117	2455249.410	2455251.512
78799 (2002 XW93)	100	1342190915 1342190916 1342191118 1342191119	2455249.431	2455251.533
78799 (2002 XW93)	160	1342190913 1342190914 1342190915 1342190916	2455249.410	2455251.533
		1342191116 1342191117 1342191118 1342191119		
79360 (1997 CS29) Sila	70	1342196004 1342196005 1342196137 1342196138	2455325.541	2455326.884
79360 (1997 CS29) Sila	100	1342196006 1342196007 1342196139 1342196140	2455325.562	2455326.905
79360 (1997 CS29) Sila	160	1342196004 1342196005 1342196006 1342196007	2455325.541	2455326.905
		1342196137 1342196138 1342196139 1342196140		
82075 (2000 YW134)	70	1342196008 1342196009 1342196133 1342196134	2455325.584	2455326.835
82075 (2000 YW134)	100	1342196010 1342196011 1342196135 1342196136	2455325.611	2455326.863
82075 (2000 YW134)	160	1342196008 1342196009 1342196010 1342196011	2455325.584	2455326.863
		1342196133 1342196134 1342196135 1342196136		
82155 (2001 FZ173)	70	1342236630 1342236631 1342236908 1342236909	2455933.230	2455934.166
82155 (2001 FZ173)	100	1342236632 1342236633 1342236910 1342236911	2455933.257	2455934.194
82155 (2001 FZ173)	160	1342236630 1342236631 1342236632 1342236633	2455933.230	2455934.194
		1342236908 1342236909 1342236910 1342236911		
82158 (2001 FP185)	70	1342211422 1342211423 1342211528 1342211529	2455553.827	2455554.399
82158 (2001 FP185)	100	1342211424 1342211425 1342211530 1342211531	2455553.862	2455554.433
82158 (2001 FP185)	160	1342211422 1342211423 1342211424 1342211425	2455553.827	2455554.433
		1342211528 1342211529 1342211530 1342211531		
8405 Asbolus	70	1342190921 1342190922 1342190937 1342190938	2455249.510	2455249.776
8405 Asbolus	100	1342190923 1342190924 1342190939 1342190940	2455249.524	2455249.791
8405 Asbolus	160	1342190921 1342190922 1342190923 1342190924	2455249.510	2455249.791
		1342190937 1342190938 1342190939 1342190940		
84522 (2002 TC302)	70	1342214049 1342214050 1342214159 1342214160	2455603.150	2455604.549
84522 (2002 TC302)	100	1342214051 1342214052 1342214161 1342214162	2455603.165	2455604.564
84522 (2002 TC302)	160	1342214049 1342214050 1342214051 1342214052	2455603.150	2455604.564
		1342214159 1342214160 1342214161 1342214162		
84719 (2002 VR128)	70	1342190929 1342190930 1342190990 1342190991	2455249.568	2455250.407
84719 (2002 VR128)	100	1342190931 1342190932 1342190992 1342190993	2455249.589	2455250.427
84719 (2002 VR128)	160	1342190929 1342190930 1342190931 1342190932	2455249.568	2455250.427
		1342190990 1342190991 1342190992 1342190993		
84922 (2003 VS2)	70	1342191937 1342191938 1342191977 1342191978	2455265.492	2455266.093
84922 (2003 VS2)	100	1342191939 1342191940 1342191979 1342191980	2455265.507	2455266.108
84922 (2003 VS2)	160	1342191937 1342191938 1342191939 1342191940	2455265.492	2455266.108
		1342191977 1342191978 1342191979 1342191980		
86177 (1999 RY215)	70	1342221751 1342221752 1342221778 1342221779	2455709.063	2455709.989
86177 (1999 RY215)	100	1342221753 1342221754 1342221780 1342221781	2455709.097	2455710.024
86177 (1999 RY215)	160	1342221751 1342221752 1342221753 1342221754	2455709.063	2455710.024
		1342221778 1342221779 1342221780 1342221781		

88611 Teharonhiawako	70	1342196099 1342196100 1342196145 1342196146	2455326.403	2455327.270
88611 Teharonhiawako	100	1342196101 1342196102 1342196147 1342196148	2455326.430	2455327.298
88611 Teharonhiawako	160	1342196099 1342196100 1342196101 1342196102 1342196145 1342196146 1342196147 1342196148	2455326.403	2455327.298
90377 Sedna	70	1342202227 1342202228 1342202306 1342202307	2455414.954	2455417.874
90377 Sedna	100	1342202229 1342202230 1342202308 1342202309	2455414.989	2455417.908
90377 Sedna	160	1342202227 1342202228 1342202229 1342202230 1342202306 1342202307 1342202308 1342202309	2455414.954	2455417.908
90482 Orcus	70	1342195997 1342195998 1342196129 1342196130	2455325.497	2455326.789
90482 Orcus	100	1342195999 1342196000 1342196131 1342196132	2455325.512	2455326.804
90482 Orcus	160	1342195997 1342195998 1342195999 1342196000 1342196129 1342196130 1342196131 1342196132	2455325.497	2455326.804
90568 (2004 GV9)	70	1342202869 1342202870 1342202921 1342202922	2455420.260	2455421.140
90568 (2004 GV9)	100	1342202871 1342202872 1342202923 1342202924	2455420.274	2455421.154
90568 (2004 GV9)	160	1342202869 1342202870 1342202871 1342202872 1342202921 1342202922 1342202923 1342202924	2455420.260	2455421.154
95626 (2002 GZ32)	70	1342202937 1342202938 1342202967 1342202968	2455421.207	2455421.575
95626 (2002 GZ32)	100	1342202939 1342202940 1342202969 1342202970	2455421.221	2455421.589
95626 (2002 GZ32)	160	1342202937 1342202938 1342202939 1342202940 1342202967 1342202968 1342202969 1342202970	2455421.207	2455421.589
95626 (2002 GZ32)	70	1342202937 1342202938 1342202939 1342202940	2455421.207	2455421.589
95626 (2002 GZ32)	100	1342202937 1342202938 1342202939 1342202940	2455421.207	2455421.589
95626 (2002 GZ32)	160	1342202937 1342202938 1342202939 1342202940 1342202967 1342202968 1342202969 1342202970	2455421.207	2455421.589
U XVII Sycorax	70	1342221837 1342221838 1342221875 1342221876	2455710.589	2455710.965
U XVII Sycorax	100	1342221839 1342221840 1342221877 1342221878	2455710.616	2455710.993
U XVII Sycorax	160	1342221837 1342221838 1342221839 1342221840 1342221875 1342221876 1342221877 1342221878	2455710.589	2455710.993